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INVESTIGATION OF MILITARY PUBLIC WORKS

REPORT

TO THE

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HOUSE OF REPRESENTATIVES

BY MR. RILEY

FROM THE

SUBCOMMITTEE ON MILITARY PUBLIC WORKS

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SUBCOMMITTEE ON MILITARY PUBLIC WORKS

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II

INVESTIGATION OF MILITARY PUBLIC WORKS

The outbreak of hostilities in Korea in late June of 1950 created an urgent need for the rapid expansion of our Armed Forces. The President recommended to Congress that immediate consideration be given to the need for appropriating funds for military and naval purposes. Congress gave expeditious consideration to the President's requests and appropriated money for these purposes in the General Appropriation Act of 1951, which was enacted September 6, 1950, in the first, second, and fourth supplemental appropriation acts enacted respectively on September 27, 1950, January 6, 1951, and May 31, 1951. In appropriating the great amounts of money embodied in these bills the Congress relied upon statements of the Department of Defense and the three armed services with respect to the pressing need for the funds requested. Included in these appropriations were large sums of money for military construction for the Army, Air Force, and Navy.

On February 18, 1952, this subcommittee began its hearing on military public works. For many months prior to this date the committee staff, composed of competent engineers, accountants, and other professional men, had been conducting an examination of all types of military construction built in the United States during the 14-month period between the outbreak of fighting in Korea and August 31, 1951. The reason for the hearings and for the pre-hearing study was to determine the actual manner in which the sums so appropriated had been spent and to see if there were not means by which the expenditures could be reduced without a loss in military effectiveness. The study had commenced on April 9, 1951. At the outset the staff visited the Washington offices of the services, including the Corps of Engineers, which is the construction service for the Departments of the Army and the Air Force, and the Bureau of Yards and Docks which performs the same function for the Department of the Navy. Following this the staff members inspected actual construction in various stages at 73 installations of the Army, Navy, and Air Force throughout 21 States. The committee and the staff enjoyed the cooperation of all of the departments both in the field and through the services of competent and helpful liaison officers.

At the conclusion of its field study, the staff prepared a comprehensive report on the conditions found at each one of the individual military and naval bases visited. All of the assembled material was collated and analyzed and from it numerous typical cases were selected which showed where money could have been saved. The responses of the services were invited to each one of these specific cases and these, together with the committee analysis and study, formed the basis of parts 1, 2, and 3 of the public-works hearings which were published during June 1952 for the information of the Congress at the time that it was called upon to consider the President's reque-t

of June 4, 1952, for $2.9 billion for military construction in fiscal year 1953.

It is not proposed in this report to repeat in laborious detail each one of the instances covered in the hearings. The Congress, the services, and the public have already been informed of these individual cases through the publication of the hearings themselves and the further specific analysis given them in the 1953 military-construction budget hearings. Many of the mistakes made and discovered have been frankly acknowledged by the services and affirmative steps taken to remedy them. Rather, the purpose of this report is to set forth the general principles of more economical military construction which were developed by the lengthy analysis above described, to show what was actually accomplished by this type of study, and to suggest to the services and to the Congress steps which the committee believes will prove helpful in military public works problems facing the country in the future.

In general, it was found that a large volume of work had been done but that in the pressure of speed caused by the Korean crisis many costly mistakes had been made. It was found as well that many independent steps had been taken by the services to cure their own ills. However, there existed at the time of the hearing and exists at the present time much room for improvement.

Many of the reforms initiated by the committee and carried out by the services have already resulted in a demonstrable saving to date of at least $72 million.[1] It is the further belief of the committee that the revised procedures adopted as a result of its study will result in even greater savings for the future. At this point, however, it must be emphasized that the goal of providing needed facilities at the minimum dollar expenditure is still far from achievement. Many loopholes still exist in the pattern, and reaching the goal remains a vital and continuing responsibility for all of the services and for the Congress as well.

Within this framework then, we set forth the areas which the committee found to be the chief points of weakness in the military public works program.

(A) PLANNING

Possibly the most important factors which interfered with economy of construction during this period were the always costly elements of speed and emergency plus the inadequacy of existing operational and construction plans to handle the peculiar needs of the Korean crisis. Planning in the field of construction had been geared to supply military needs under two conditions. The first concerned the peacetime program of the Regular Establishment. The volume was geared to authorized strength. The type of construction was for the most part permanent. In the field of design, the wishes of the using service were given great consideration. Design of the buildings struck something of a balance between the needs and desires of the using services and the actual amount of money they could get approved by the various departmental and executive budget and review groups, and could

[1] The $72 million is made up of 4 percent on the Navy's 1952 program of $800 million, 1953 program of $400 million, and the Army's 1953 program of $600 million. Air Force savings are in addition to the $72 million figure. The Navy voluntarily initiated this method of saving, and the committee cut the 1953 Army program by the same 4 percent, feeling that the Army should be able to effect the same economy. See pp. 30–43 of H. Rept. No. 2316 of June 26, 1952.

obtain from the Congress. There was for this type of work, in most cases, no great problem in construction time. There was no need for accelerated building and there existed proper lead time for design, contracting, and construction. A desire to have construction so designed that it would blend in with the architecture of surrounding buildings was considered of importance. In short the peacetime military program followed the same general rules as commercial construction.

The second condition upon which military construction thinking had centered was war, involving a total mobilization of manpower and industry, and the rapid construction of temporary type buildings under expedited contract forms.

The requirements of the Korean crisis fit neither slot. This emergency was not followed by a total mobilization but did demand a great and immediate increase in the standing forces. Further since no man knows for how long a time the Communist threat to peace is going to continue, the increase had to assume a permanent rather than a temporary character. This condition was considered to call for the fulfillment of three basic requirements. First, construction necessary for military purposes was to be done with all possible speed. Second, this construction was to be, in large part, of a relatively permanent type. And third, under an order of the President dated July 21, 1950, it was to be as "austere" and economical as possible, with all elements of useless ornamentation and overdesign eliminated.

Planning and organization had not been developed to the point necessary for fulfillment of all of these requirements simultaneously. This was particularly true of the Air Force. This service was forced into tremendous and rapid expansion at the same time that revolutionary changes in technology and strategy were taking place in military aeronautics. New types of fighters and bombers and revised tactical considerations were causing changes to be made in designs of airfields themselves. Revised concepts in strategy were affecting the choice of even the parts of the country where new bases should be located.

Such matters, of course, had a definite adverse effect on large-scale construction which demands above all else that you know precisely what you want and where you want it well in advance of the beginning of work.

Examples of the effect of these matters on economy and efficiency are numerous. A survey of the Offutt Air Base at Omaha, Nebr., the global headquarters of the Strategic Air Command, revealed the following:

On October 24, 1950, the Strategic Air Command (SAC) decided to locate global communication facilities at this base. These facilities comprise three separate units consisting of a communications center building at the Offutt Air Force Base, the power and transmitter building at Meade, Nebr., and the receiver building at Elkhorn, Nebr.

According to information received from the Corps of Engineers, a delay of 9 months occurred because of the inability of the Air Force to determine whether the communications center building should be incorporated in the proposed SAC headquarters building or in a separate structure, and other siting considerations. This important question was not resolved until August 2, 1951.

In addition to the indecisions regarding the siting of the facilities, the corps informed the staff that a 6-month delay (concurrent with the above delay) developed following the corps' request for outline plans on October 24, 1950. The delay was described by the corps thusly:

> Due to major changes in schedule requirements, the office of the Chief of Engineers (OCE) was unable to furnish definitive plans for Globecom structures until January 5, 1951. Preliminary plans sent to MRD (Missouri River Division) for approval January 29, 1951, tentatively approved by MRD February 2, 1951. Revised preliminary plans for communications center to MRD and USAFIR for approval June 27, 1951, and returned approved July 9, 1951. Estimated time lost by revisions occasioned by revised criteria—6 months.

In discussing the current status of the communications-center building, the corps advised:

> Project plans were completed and construction started about August 2, 1951. At a conference held August 7 discrepancies of a very serious nature became apparent in the electrical lay-outs and mechanical design due to lack of detailed data from using service. No decision was reached by August 16 at which time the architect-engineer was instructed to stop design on the revised plans until firm requirements were established by SAC. A construction stop order was issued also. (This applies to the interior of the communications building—Ed.). At the present time, design is only proceeding on outside utilities for the communications center, no design on revised interior is being accomplished.

The corps informed the staff that difficulties due to changes by the Air Force had also developed in connection with the transmitter and receiver buildings as evidenced by the following quotation:

> Construction was proceeding unhampered until August 7, 1951, when conference with the using service was held. Air Force headquarters AACS then wanted the following:
>
> (*a*) Power building, transmitter site—numerous mechanical and electrical changes desired.
>
> (*b*) Receiver building—revised floor plan and numerous changes desired.
>
> (*a*) and (*b*) above are causing delay in completion of construction for these items, but it is anticipated that the above revision will not cause lengthy extension of construction time.

Delays of many months due to changes and indecisions by the using services illustrated by this project are not conducive to economical and efficient contract and construction administration. In addition, the actual completion of facilities is delayed.

Another example going to airfield design occurred at Walker Air Force Base, Roswell, N. Mex. At the Walker Base original plans called for the construction of a medium-bomber field. For such a purpose airfield parking is provided by a uniformly paved concrete apron, or a mass apron. When work was in progress the mission was changed to a heavy-bomber base for which a different type of apron of the ladder or stub type could be used. The ladder type consists of concrete strips adjacent to the taxiways on which the planes park, with asphalt paving in between and costs about half of the cost of a mass apron. The apron was constructed as a mass apron, but if the mission could have been fixed as a heavy-bomber base before construction started, a substantial saving estimated at 50 percent, or $837,000, could have been made by laying the ladder-type apron instead.

Again, changes ordered at the Nellis Air Force Base at Las Vegas, Nev., on the day before the contract was awarded, included a complete revolution in the job from one to extend existing runways to construction of a complete new runway. The need for this was

occasioned by a decision to use that field for jet fighters which required different types of runways from those originally conceived.

An improvement in the type of fuel for rockets caused a termination of a contract for specialized fuel-storage facilities at Tinker Air Force Base in Oklahoma. When the facilities were some 17 percent completed it was decided that the fuel for which plans had been made was not proper for revised techniques. The whole job was then stopped.

Another example of failure to decide at the outset upon what was wanted occurred at the Benecia Arsenal, Benicia, Calif., with the following results: The Corps of Engineers awarded negotiated contracts, instead of using competitive bid contracts, for the construction of two large warehouses and for the conversion of existing storage buildings into shops at this installation.

The directive for this work was dated December 19, 1950. The corps advised that, due to the numerous major changes in design instructions by the Ordnance Corps of the Army, the preparation of the plans and specifications for this work was delayed. On June 7, 1951, or about 6 months after the date of the directive, the corps invited seven selected contractors to submit proposals to be opened on June 21, 1951. Three proposals were received for the warehouses and five for the conversion work. After negotiations with the firm submitting the lowest proposals, the contracts were awarded on June 30, 1951, in the amount of $5,843,253.50.

The manner in which these contracts were processed restricted competition and allowed the selected contractors insufficient time to figure their proposals. If time had not been wasted in the design stage through indecisions of the using service, firmly developed plans and specifications could have been completed earlier and the contracts could have been awarded through regular advertisement and competitive bidding. This would have accorded other qualified and interested contractors the privilege of submitting bids, and probably would have resulted in substantially lower cost to the Government.

One of the contractors submitting proposals on this work informed the staff that not only was the bidding time inadequate but that some of the plans and specifications were vague. He advised that he was still endeavoring to get interpretations from the corps by telephone on the day before the proposal opening. He stated that with more time, which would have permitted him to secure closely figured proposals from subcontractors, he probably could have cut 10 percent or more from his proposal. This contractor expressed the belief that the same situation was true of the other bidders, including the low bidder.

The committee was impressed by the fact, frequently demonstrated throughout the study, that the normal construction process of allowing sufficient time for orderly design, full opportunity for wide bidding, and realistic completion dates for the work cannot be violated without greatly adding to cost. A good example is the history of barracks construction at the Air Force base in Amarillo, Tex. Many complaints had been made of overcrowding of airmen at existing barracks throughout the country. This impelled a great rush to get barracks built at Amarillo. On March 13 a negotiated contract was made for the building of 119 dormitories for which standard plans were issued. The negotiated amount was $8,727,800. The corps advised that at the time proposals were received revisions were under-

way, but it was not known when these changes would be available. Therefore, in order to expedite the start of construction, negotiation was made on the original plans. Subsequently major changes costing in excess of $1 million were made in plans and specifications. An error made by the Corps of Engineers in reviewing plans and specifications for mess halls caused more confusion when areas were found insufficient to accommodate the boilers ordered. A real measure of the excess cost for the purposes of speed was shown when competitive bids were received for 102 additional and identical airmen's dormitories. A contract was awarded at the rate of $62,683 per building to the low bidder, which was the same firm having the first contract. This represented a saving of $20,000 per building, almost 24 percent, on the second set of barracks. Even after giving all due consideration to the fact that additional experience had been gained, and plans settled, etc., by the time the second contract was made, the example still stands as good proof of the point.

Then after all of this rush, changes were made by the Air Force in the training program with the result that a review on March 20, 1952, showed only 1.22 men per room at Amarillo as compared with the normal criterion of 2.72 men per room.

It is obvious that opportunity does not exist oftentimes during emergency periods for all the time necessary to complete an orderly construction cycle. The prime objective should be, therefore, to minimize the difficulties inherent in speedy construction by the maximum development of advance planning. Perhaps this cannot be done to the extent necessary to handle all cases but it is essential that a planning program be carried forward by every means possible. For this purpose the Congress has appropriated considerable sums. For fiscal year 1953, $52 million have been given to the Air Force for this purpose, to the Navy $2.5 million, and to the Army $5 million.

(B) LACK OF STANDARDIZATION

It was noted that throughout all of the services there was a repeated need for certain buildings which serve the same essential purposes. This circumstance gave a clear opportunity to save building time and money, and to reduce confusion by the expedient of standardizing plans. For example, the Army, Navy, and Air Force all needed barracks, mess halls, bachelor officers quarters, warehouses and similar repetitive structures, and they needed them for similar purposes. The committee and the staff, however, found a wide variation in the design, cost, and accommodations offered by such buildings as were erected during the period of study. The variation existed not only between similar structures, such as barracks, built by the different services, but the variation existed within the services themselves.

A general criterion had in fact been laid down by the Munitions Board for barracks construction which called for a maximum of 72 square feet of sleeping space per man for "troop housing." It was seen, however, that such a criterion meant little as far as actual building costs and designs were concerned. The term "troop housing" was interpreted to concern only the lower rated enlisted men and there was no figure to use in housing noncommissioned officers. A more drastic shortcoming was that the 72 square feet standard applied only to sleeping quarters and the amount of space in the barracks used for

other purposes had no limitation. This resulted in leaving the amount of space for purposes other than sleeping space up to the discretion of those ordering or approving the design. It was found that cost and uniformity often played little part in the exercise of this discretion.

The committee developed for use in comparison the only criterion which appears to make sense in barracks construction and design. It is the number of gross square feet per man per building. With a reasonable, constant figure of this order, in the neighborhood of 120 to 125 square feet, designs and plans can be developed which will produce a uniform cost figure and as well insure that all services will be offering the same or comparable accommodations and at the same time will be allowed some variation to take care of their individual needs.

The committee staff had established the figure of 120 square feet gross per man per building as a standard by which it compared various barracks built throughout the country and upon which it invited the comment of the services. All three services in past and current construction had substantially exceeded this yardstick.

In the Air Force design had undergone many changes. Their needs were considered to call for the room type rather than the Army and Navy open-bay type design. The original designs provided about 164 square feet gross per man. Revisions took place to cut down on this square foot figure. At the time of the hearings the design concepts had been narrowed down to essentially two general plans—the SAC type and the USAF type.

The wide variation in permanent (25-year life) Air Force barracks is well shown by a comparison of the information submitted to us by the Air Force on barracks constructed at Keesler and at Sheppard Air Force Bases. Photographs of the completed Keesler barracks near Biloxi, Miss., show a three-story flat-roofed building without basement. The frame is of reinforced concrete with concrete block curtain walls. Awning type windows are almost continuous around the building at each story. The concrete roof slab projects approximately 3 feet around the entire perimeter of the building.

Pictures of the 25-year barracks constructed at Sheppard Air Force Base near Wichita Falls, Tex., are of two-story frame construction with a flat roof and no basement. The exterior walls are covered with asbestos shingle and the windows are of the less expensive double hung wood sash and are much less plentiful than at Keesler.

A comparison of the area and cost figures as submitted by the service to the committee on the standard "Data sheet on barracks" is given below:

	Keesler	Sheppard
Area per man	151 square feet	149 square feet.
Cost per man	$1,443	$1,041.
Cost per square foot	$9.55	$6.98.

The vast difference in the type of construction, the materials used, and the amount of maintenance that will be required indicated an entire lack of standardization of 25-year barracks construction.

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In the case of the Army, its long experience had developed traditional designs and much less trouble was encountered. Nevertheless, considerable variation existed within that service as well. As has been previously noted, the main trouble with the Army (and with the other services) was that standard plans had been developed for temporary emergency-type structures but not for austere, economical, and functional permanent-type buildings.

The interest of the committee in this phase of the problem had, it is believed, some very concrete results. These accomplishments of this congressional interest, coupled with the cooperation of the services, can be reported: While the hearings were in progress, the Navy developed a new standard three-story barracks, resulting in a saving of 25.5 percent per man. The Air Force decided to offer the SAC-type barracks as its standard design, and the Army has developed new standard barracks for its purposes. All of these approach very closely the original criterion of this committee—120 square feet gross per man! The Army has designed and put into use the exposed concrete column and beam-type of barracks construction, and the Air Force is developing designs to utilize more economical types of construction.

There was ample evidence developed at these hearings to support a requirement that standardization in the design of all repetitive type structures at least within each service be achieved even to a greater degree than is present today. The benefits to be derived are quite clear. Time and money will be saved by having fixed and determined plans and specifications ready when the need for actual building arises and uniform accommodations will be offered adapted to the varying needs of the different services. Perhaps more important will be the benefits of mass construction, since the contractors and builders will gain experience in definite types of work and greater efficiency can be expected.

(C) OVERELABORATE DESIGN

In addition to the lack of standardization there were found to be many examples of overelaborate design which added measurably to costs. It must be remembered that the President of the United States on July 21, 1950, had issued an order that "austerity" be a central concern for military construction. This Presidential order had been followed by directives of the Secretaries of the services. The committee found, however, many examples of overelaborate design which poorly served the purposes of austerity. For example, in the spring of 1951 a building was erected for Army Ordnance under the supervision of the Corps of Engineers at the California Institute of Technology, Pasadena, Calif. The contract for the cafeteria and other structures was for $228,817. The cafeteria is small but ultra-modern. It is entered through a pair of $700 plate-glass doors set in bronze frames. It has a circular snack bar with pedestal-type leatherette seats and an outdoor dining terrace. Stainless steel is widely used as are rubber-tile flooring, cast bronze hardware, glass, etc.

At a strategic air command base in the Midwest, the control tower and crash truck building provide another example. Foundation and walls are of reinforced concrete 14 inches thick with exterior walls of faced brick, backed up with concrete brick. There is an elaborate terrazzo stairway with an ornamental iron railing. The main entrance (an area about 7 by 18 feet) is of plate glass with an aluminum

frame. There was an excessive amount of ceramic and asphalt tile, and the kitchen and snack bar are unnecessarily elaborate.

At the Edwards Air Force Base, Muroc Lake, Calif., the administration building is largely reinforced concrete, has poured concrete walls, roof, and interior portion. Two ornamental concrete pylons flank the main entrance which has a double vestibule formed by three pairs of three-fourth-inch plate-glass doors surrounded by corrugated glass panels set in aluminum frames. Space heating is by hot-water coils in the walls and floors, controlled by individual thermostats in each room. Hot water is supplied by an electric boiler. The fire station is equally elaborate. Both of these buildings, it must be mentioned, were started in 1949 and 1950 and perhaps do not fall strictly within a review of the austerity program. However, they may well be compared with austerity criteria to see a true measure of cost differences. Such a comparison reveals that the Government has paid an excess which amounts to $59,717 for these structures.

An example of expensive brickwork is the boiler house at the Hooker Electrochemical Co. plant, Niagara Falls, N. Y. Plans for this structure prepared by a private engineering firm and approved in the corps' New York office, show elaborate and costly brickwork which is out of place in any industrial plant, as well as being wasteful of time and money.

Each of these cases was frankly admitted by the services to be examples of overdesign, at least under austerity standards.

The Navy barracks at Memphis, Tenn., being built for use by the naval air station detachment, is still another instance. Plate glass had been used freely on windows; there was excessive plastering and terrazzo flooring. There was much ornamental limestone and greenstone facing on the buildings as well as a considerable amount of acoustical tile. The response of Admiral Joseph F. Jelley, Chief of the Bureau of Yards and Docks, to the evidence was immediate. From the hearing table he ordered his aide to check the features mentioned by the committee and to go forward with an intensive review of the plans and specifications on the site at Memphis. This review and on-the-site inspection resulted in immediate elimination of overdesign elements in the amount of $60,000. The committee was advised that had this review taken place before construction commenced the saving would have been $300,000. There was, however, an even more important element involved. Through a comparison of the design at Memphis with data developed by the committee, the admiral found that the chief element in added costs was the use of the traditional Navy two-story barrack design. This type of building offered only two-thirds of the housing accommodations of a three-story structure while at the same time cost nearly as much for the expensive features of foundation and roofing. A change in this principle would have resulted, together with economies in design, in a saving of $1 million out of a $6 million contract.[2]

The committee has not noted these examples of overdesign, together with other instances of the same trouble, for the purpose of overemphasizing isolated cases and attempting to characterize and pillory the entire building program. There were found as well cases in all services where great lengths had been taken to save money in construction. For instance, when a commanding officer in an Eastern

[2] This was followed by inspection-team surveys of all Navy construction which resulted in the over-all saving of 4 percent on the Navy program.

State requested permission to erect more expensive structures, his attention was quickly called to austerity standards. Nevertheless, in a program of this size, individual instances of overdesign if repeated often enough can amount to a great sum of money which only vigilance can save. This has been proven by these hearings. As reflected in the 1953 military public works appropriations hearings, the actual saving in revised economical and standard designs was shown to be $72 million in Army and Navy expenditures together, as a direct result of the work of this committee. It is now too early to estimate the saving effected by standard barracks and other structures now under design for the Air Force, over the diversified structures found now throughout the country. The committee will wait with interest the facts as presented in future hearings.

(D) CONTRACTING

The record shows that three general types of contracting procedures were used during the 14-month study period.

The first type was the traditional, lump-sum, advertised-bid contract. This well-known procedure does not need much comment. Everyone agrees that where time is not of the essence this form guarantees through the process of free competition that the Government obtain the product at the lowest market price. Since prepared plans and specifications are a condition precedent to the solicitation of bids, a more orderly job of construction can be expected. In the emergency need for construction, however, there were many cases where time was of the essence and normal procedures could not be followed. To meet such problems the other contract forms were authorized.

One of these was the negotiated contract which follows general contract steps except that proposals are solicited from only a selected and limited number of contractors believed to be capable of handling the job.

The other type was the cost-plus-fixed-fee contract. In this case the Government estimates the job [3] and comes to an agreement with the contractor for a fixed fee to perform the work. Testimony indicates that use of this procedure is justified in only two instances: where the need for construction is so urgently acute that planning and building must start at the same time, or in rehabilitation work where it is unfeasible and inefficient to draw plans and specifications.

Cost-plus-fixed-fee contracts

The cost-plus-fixed-fee contract has come under great criticism. However, where the project is to rehabilitate a large installation, base, or camp which has remained idle and without maintenance for a long period of time the use of such a contract procedure appears to have many benefits with one important reservation. The reason for this is that it is almost impossible to tell through inspection just how much work will be needed to place the base or plant in a proper state of repair. Concealed piping, framing, sheathing, etc., might or might not need entire replacement. The true condition of the building or facility can only be discovered when repair work is in actual progress.

[3] The Government cost estimate is sometimes not an adequate safeguard. At Fairchild Air Force Base, the Corps estimated $3,026,705.24 for the work, and the bulk of the bids were in the neighborhood of $2 million. Although this disparity was on a competitive bid job, it shows the danger of a unilateral estimate by the Government.

The conditions found in the rehabilitation of the Naval Training Center at Bainbridge, Md., the Cornhusker Ordnance Plant and the Nebraska Ordnance Plant in the State of Nebraska, Sampson Air Force Base in New York and many others studied throughout the hearings, as well as many barrack rehabilitation jobs attempted under lump-sum or unit-price contracts, show to what extent the real trouble is found only after the work actually commences. If the job is efficiently managed under a CPFF arrangement, the added costs can be pretty well held down. On the other hand, the alternatives are the use of competitive or negotiated contracts, including unit-price contracts, plus numerous change orders or supplemental negotiated agreements. In such cases the Government is almost forced to accept the bid of the contractor doing the work, on the change orders or supplemental agreements since he is in a superior bargaining position. If, however, the work has progressed under a CPFF contract and the scope of the contract is changed, the only thing to negotiate is a possible change in fee, for the costs are the business of the Government.

At the beginning of this discussion we stated an important reservation. This is that above all else the CPFF contract project is only as good as the officer supervising it and the contractor doing the work. Excellent examples of efficient supervision were shown to us in the course of this study. The job at the Naval Training Center, Bainbridge, Md., can well serve in this regard. This is but one instance of good work done, but there are examples where grave troubles can be traced in good measure to a lack of close control by the Government. In an effort to make comparison and judgment on this type of contract the committee staff devised a ratio which many of the Army and Navy witnesses agreed would be helpful for this purpose. The ratio is the number of nonmanual workers on any one job to the number of manual workers for every month of operation. It was noted that in the jobs which all agreed were effectively supervised and concluded a regular curve could be plotted. It showed a relatively large percentage of supervisory personnel on the job at the very beginning and toward the close of a job. This was shown to be necessary where planning and construction had to proceed simultaneously. If proper organization is to be obtained, a relatively large number of supervisors must be present at the outset of the job. Then as the job progresses and increases in size the ratio of supervisors and administrative personnel to manual workers should grow smaller. This means that the work has been properly organized and that the organization can handle the increasing numbers of manual workers and responsibilities. Toward the end of the job the ratio grows larger again as the manual workers are gradually discharged and the organizing sections start to perform the necessary housekeeping and clean-up functions. Danger signals may be noted in changes from this curve. Furthermore comparisons may be made of the ratios found on different jobs performed under like circumstances to tell whether overhead costs are going to be excessive from an overburden of administrative help.

Except in the case of rehabilitation work performed under the supervision of only the most able men, the CPFF contracts during the test period ran their usual dangerous course. A large part of this, of course, is inherent in the circumstances which must exist before such a contract is made. That is the situation where plans and specifications have not been made and the call for speed prevents orderly

construction procedures and demands that planning and construction proceed concurrently. The history before us shows that the emergency should be very great indeed before this type of move is taken, especially on new construction, even when installations are needed quickly. Time and money will be saved in the long run if plans and specifications are prepared before the work commences. Remarks by Brig. Gen. John R. Hardin, Assistant Chief of Engineers, on this subject are of interest:

> Generally it falls in the category of less effective effort on these cost-plus-fixed-fee operations simply because by the very nature of the beast they are not undertaken with the planning and the organization which you will find in a deliberate type of contracting where a man has had ample time to prepare his organization, and where he knows definitely what he is going to do. Now, when you have a firm contract with a man, he only accepts changes to that contract if you pay him something for it. He is not inclined to be changing his scope of work or his procedures, because it upsets the niceties of a balance in material and men and what not to make the job run smoothly, to be changing plans. That is the reason why you adopt one of these cost-plus-fixed-fee operations, because it is so subject to changing requirements of the Government. Otherwise you would bog down and never get another type of contract going. * * *
>
> I know that would be my attitude now, and as far as our procedures go I think I would be less inclined to use cost-plus-fixed-fee contracts on things which the using services said we have to have started right now, and we will tell you more about what the full requirements are when we determine those requirements. This cost-plus-a-fixed-fee operation, which I discussed with you at length yesterday, comes from thinking that is inherently a production man's approach to a problem, and it has been applied to construction. While the construction industry on a private basis uses this approach and cost is not a particular concern of private ownership, I do not think that the cost-plus-a-fixed-fee operation lends itself to Government operations in construction. There are just too many pitfalls in it. It should be reserved for the extreme cases of emergency which, again, I think has been overdone in this present emergency, and I believe my studies will bear me out in that thought.

Negotiated contracts

Wide use of the negotiated contract was made in this emergency. This type also serves, in the main, the interests of speed. It is most often used when only partial plans and specifications have been developed. In this case a selected number of contractors in whom the Government construction agencies have confidence are approached and bids are solicited from them. Since, theoretically, there is no question about the competence of those selected there is not present the fear that they will be unable to finish the job and some safety is felt in allowing them to begin work with only partially developed plans. The manager of the Contracts Branch, Bureau of Yards and Docks, condensed this explanation into a very few words describing circumstances justifying this type of contract: "Time and whether or not we have adequate specifications." However, the record showed that a great many of these contracts were let when plans and specifications had in fact been completed.

A reason for this use was advanced by Admiral Joseph F. Jelley:

> Mr. DONNELLY. Can you tell the committee this: If you have plans and specifications to submit to contractors from whom you invite proposals for a negotiated contract, why do you use the negotiated contract instead of competitive bid after advertising?
>
> Admiral JELLEY. That ties in somewhat with the question of penalties, liquidated damages, and completion time. I realize—I am not kidding myself—that by putting a penalty in one of our contracts in times like these, that we are

not guaranteeing to get our job done. The contractor has so many reasons through the critical materials situation and the controlled material plan that we can never hope to enforce liquidated damages.

Of course, if a contractor absolutely throws up his hands and quits, it would be different. But very few will do that. On a few projects that we consider particularly urgent, we have gone to contractors that we felt were able to complete the job on time whether there was a penalty in the contract or not. And we have in those cases really limited ourselves to contractors that we thought were capable of doing the job. When you advertise widely, and accept bids from everybody, anyone who can get a bond can bid. But just because he got a bond is no guarantee that he will finish the project on time or as fast as possible under the present condition. So, on those cases where we had a limited list of bidders, we felt the project was so urgent that we wanted something more than the threat of liquidated damages to try to insure that we get our job done promptly.

Mr. DONNELLY. I see.

Admiral JELLEY. And once in a while we can save a few weeks in advertising time. We can call four contractors in and say, "Here are the plans and specifications, let us sit down and talk about them and make sure you understand all the details because you have to come back in 3 days with a bid." I do not mind telling four contractors that in a meeting, but if we have to put plans in the mail it takes time for contractors to get the plans after the notice is published. And when you are dealing with a large number of people, if you only give them a week for bidding you start getting requests for extensions because contractors cannot get prices from the subcontractors. But if you call a small number in and sit down and say, "This is a really urgent job and you have been selected because we think you can do the work and it just has to be done on time, this is what it amounts to and now go through the plans, item by item, so that you understand it thoroughly." You can get quick work that way. We use it as an expedient. We used it in less than 2 percent of our contracts last year, but it has a value. It is a very valuable form of contract, particularly in times like these.

Mr. KATZ. It also has a place where a specialized project is involved. We do not want a paving contractor taking water-front jobs because he is the low bidder and then discovering that he cannot do the job because it requires specialized experience. In such a case, we will select seven or eight water-front contractors and take their bids.

Use of the three different types of contracts

In the 14-month test period all of the various types of contracts for military public works in the amount of $1 million or over ($100,000 for CPFF contracts) were submitted to the committee for study. The Bureau of Yards and Docks had made four negotiated contracts in excess of this sum. The Corps of Engineers had made 18 contracts of this type for the various bureaus of the Army and 67 negotiated contracts for the Air Force. Of Navy contracts, all four had plans and specifications fully completed on the date of award. Of the Army contracts 10 had plans and specifications fully completed on this date, and in the case of the Air Force 42 contracts had their plans and specifications in a similar state of completion. It is difficult because of the technical nature of certain of these jobs to pass complete judgment on this wide use of the negotiated-type agreement, particularly by the Corps of Engineers, when plans and specifications were already prepared. None of the services has the illusion that this type of agreement best protects the taxpayer from the point of view of money saved. In fact there appears little question but that only free and widespread competitive bidding presents the degree of protection necessary to get the lowest price on any construction contract. On September 26, 1951, General Hardin expressed concern over the growing use of the negotiated contract and to keep this situation from getting out of hand sent a telegram to all division engineers within the continental limits expressing this thought:

COFFENGRS, DEPARTMENT OF THE ARMY,
Washington 25, D. C., September 26, 1951.

All division engineers except UMVD LMVD MRD.
Div. Engr. Missouri River Div. From EN GKM.

Growing use of negotiated construction contracts is cause for concern to Chief of Engineers and is leading to contracting industry discontent. Request you follow policy prescribed in letter 16 March ENGAC 161 which intended that formal advertising be followed unless exceptional circumstances were present. Letter follows. Notify districts.

JOHN R. HARDIN,
Brig. Gen. USA (WD), Asst. Chief of Engr. for Mil. Constr.

From its study the committee has not concluded that either the CPFF or the negotiated contracts are inherently bad. Both indeed have their purposes. The committee has not concluded that CPFF or negotiated contracts have no place in a vast and varied construction program. There may well come a time when great speed in construction is necessary at any cost and such contracts may then be indispensable. It is believed, however, that the negotiated and CPFF contract could have been used with greater caution and in the future must be used only after the most careful judgment is made that the need for a particular installation is so great as to justify such use.

Peaking of obligations

Another aspect of the study was the analysis of the rate of obligations per month during the 14-month period in question. It was found that in the month of June 1951 nearly $500 million was obligated by the Bureau of Yards and Docks and by the Corps of Engineers which included therein funds obligated for the Air Force. The other month of highest expenditure was May of 1951, in which less than $200 million was obligated. This means, of course, that in one single month more than two and one-half times as much money was obligated as was obligated in any other single month of the entire period. Neither can this be explained by assuming that all of these funds were of the fiscal-year variety, for a further breakdown showed that this peaking of obligations occurred to quite as great an extent in the case of "no-year funds." This latter variety did not lapse at the end of the fiscal year.

A breakdown between the services showed the most violent peaking in the obligation of Air Force funds although the other services showed quite the same type phenomenon. This was interesting from several points of view. In the first place, summer is not a good season in which to concentrate award of construction contracts, at least on projects to be built throughout most of the United States. The reason has been explained to us by experts; it is that the winter months make construction more difficult. For a job of considerable size it is normally better to award the contracts in the early spring so that full advantage can be taken of good construction weather. The second point of interest is this: There was described by important service witnesses a feeling of compulsion to spend all the funds appropriated, if at all possible, before the end of the fiscal year regardless of the fact that no-year funds were involved as well as fiscal-year funds. Representatives of the Air Force, the Corps of Engineers, and the Bureau of Yards and Docks have testified to this effect.

The rush to obligate the funds for the Nellis Air Force Base at Las Vegas serves as a good example. (This project was noted earlier in the Planning section of this report.) On June 1, 1951, bids were opened for a project requiring the extension of two runways. On June 6 the Air Force notified the Chief of Engineers of major changes in the contract for which plans and specifications had not been prepared. Regardless of this, on June 7, 1951, a contract was awarded for the original purpose (which all knew was not to be performed). The contractor was held in a state of partial idleness for 2 months at the expense of the taxpayers before substantial change orders were negotiated for the entirely new job of building new runways. A desire to obligate funds before the end of that fiscal year played an acknowledged part in this decision.

An example of the rush to obligate year-end funds is shown in the construction of the Mountain Home Air Force Base in Idaho. On June 4, 1951, a representative of Military Air Transport Service (MATS) called a representative of the Walla Walla district of the corps and inquired as to the amount of funds that could be obligated by June 30, 1951, for rehabilitation work at this base. The MATS representative was advised that $300,000 could be obligated by June 30, 1951. By letter dated June 5, 1951, the North Pacific division office advised that district office of the scope of the additional work desired.

By subsequent letter dated June 21, 1951, the office of the Chief of Engineers authorized an expenditure of $922,000 at this base and stated in the letter: "Funds must be obligated by June 30, 1951." It will be seen that this authorization exceeded by $622,000, or three times the amount which the district office had advised MATS they could obligate at this base by June 30, 1951.

Faced with these instructions, the entire amount was obligated by increasing the work under existing contracts through negotiating change orders without the benefit of completed plans and specifications. The largest of these negotiated change orders was in the amount of $628,850, which was added to an existing contract in the amount of $668,608. Some indication of the pressure on the district office to obligate the funds is reflected by the following excerpt from a report on the negotiations dated June 30, 1951, referring to the specifications prepared for this work:

> The specifications were merely an outline of the type of system desired and required the contractor, among other things, to design the entire lay-out. This information was transmitted to the contractor that afternoon with an urgent request to prepare an immediate estimate in order that the cost of the over-all additional proposed work might be ascertained.

This committee believes that such an attitude must be discouraged. Naturally the Congress expects at the time appropriations are justified before its committees that a sound program of obligation will be put into effect and that no more money will be requested than such a programs calls for. Normally, therefore, funds requested as urgently needed for a fiscal-year program should be backed by solid plans to spend this money wisely during this period. However, if something occurs which would prevent the wise, orderly, and economic obligation of such funds, it is by no means congressional policy that these

funds be spent simply for the purpose of spending. The rule to govern all actions in this regard must be wisdom and economy in obligation and this must take precedence over all other considerations arising out of the accidents of fiscal-year appropriation and funding. The same rule must apply as well to fiscal-year funds as to no-year funds.

Change orders and supplemental contracts

There are numerous cases proving the point that substantial change orders and negotiated supplemental agreements have a great tendency to prove costly to the Government. Some of the reasons for this have already been stated and the others are equally clear. The advantage in the negotiation is with the contractor already on the job and the Government is deprived of the benefits of competition. Usually the Government can be sure of only one thing in this type of negotiation; that is, it may expect to pay more than the competitive bid price and can certainly never expect to pay any less. For small changes normally expected this is not too important but when, as in the case of the Mountain Home Air Base and many other examples, the supplemental agreement is as large or larger than the original contract some grave troubles in arriving at the lowest possible figure by negotiation may be expected.

The following comparative figures were prepared by the staff for a negotiated supplement to the contract for the Fairchild Air Force Base, Wash., and are impressive on this point even after all explanations have been offered:

Description of item	Unit	Unit prices		Excess of unit prices in negotiated supplement over unit prices in competitive awarded contract	Estimated quantities of material in negotiated supplement to original contract	Excess costs to Government
		Competitive contract No. DA-45-164-eng 1131, $2,051,323.50, May 31, 1951	Negotiated supplement No. DA-45-164-eng 1131, $1,934,764, June 29, 1951			
Sand or sandy gravel fill	Cubic yard	$0.49	$1.11	$0.62	144,700	$89,714
Crushed base course material	Ton	1.55	1.90	.35	91,400	31,990
Excavation, unclassified	Cubic yard	.32	.41	.09	235,000	21,150
Asphaltic cement	Ton	33.00	37.00	4.00	4,700	18,800
Asphaltic concrete	do	4.77	5.00	.23	66,800	15,364
Asphaltic prime cost	do	40.00	50.00	10.00	720	7,200
Crushed leveling course material	do	1.87	2.19	.32	18,300	5,856
Total						190,074

Most of the cases of this type could be traced to changes in requirements or inadequacies in advance planning and improvement in these fields will doubtless result in fewer occasions of this sort arising.

Establishment of the Office of Director of Installations

Secretary of Defense Lovett appeared before the House Appropriations Defense Subcommittee in connection with the studies that had been made and concerning the departmental presentations for fiscal year 1953 funds. The Secretary advised the committee concerning his problems in military construction and was in turn apprised of the matters which this committee's study had disclosed.

Thereafter a very important step was taken to put into effect many of the lessons learned from congressional review of this problem. Public Law 534 of the Eighty-second Congress, approved July 14, 1952, directed the Secretary of Defense to maintain direct surveillance over the planning and construction by the military departments of all public works projects and to exercise such surveillance through a civilian official of the Department of Defense to be known as the Director of Installations. The implementing directive of the Secretary of Defense, dated September 20, 1952, has outlined the scope and character of this office and the committee notes with approval the goals of developing uniform design criteria and construction standards with special emphasis on reducing unit costs and the development of guiding principles for the preparation of public works programs.

CONCLUSIONS

1. The committee found that the central areas of weakness in the military construction program within the United States were: (*a*) Lack of advance planning, (*b*) failures in standardization of repetitive-type structures, (*c*) lapses in attention to austerity standards, (*d*) too much use of the negotiated and cost-plus-fixed-fee-types contract for new construction, (*e*) lack of control in the conduct of certain CPFF contracts, (*f*) too frequent use of the change order and negotiated supplemental agreement, and (*g*) the uneconomic and violent peaking of obligations in the last month of the fiscal year for both year end and no-year funds.

2. The committee found that close congressional attention in these areas coupled with the cooperation of the services can achieve constructive results. As an example the committee can report savings in the amount of $72 million this year as a direct result of its own studies.

3. The committee found that many concrete steps are being taken to strengthen military construction procedures. These include (*a*) the appointment of a Director of Installations for the Department of Defense to exercise surveillance over the military construction picture, (*b*) definite improvement in approaching the goal of austerity, and (*c*) certain advances particularly in the case of barracks toward standardization of plans and specifications within each service.

4. Despite improvements a satisfactory situation still does not exist.

5. One of the greatest fields for improvement is in the advance planning for military public works. The money requested for this purpose has been appropriated. The problem is to translate military requirements to the extent possible into concrete plans for construction. The committee has no illusions about the difficulty of this task. Nevertheless without it no program of rapid construction can take place with efficiency.

6. One phase of the planning and design problem presents a great opportunity for more efficient and economic construction. This concerns the standardization of those types of buildings which are found throughout all of the services. There is no reason why this goal cannot be reached immediately for the familiar structures found on all military and naval stations. Standardization for such buildings as barracks, mess halls, warehouses, BOQ's and the like should almost

assume the proportions of a condition precedent for future appropriations. Perhaps a small degree of variation may be justified to accommodate certain different types of problems arising in each of the three services. However, within each service differences should certainly be minimized and even as between services, standardization and not variety should be the goal.

7. In addition to increased standardization a great deal of room for improvement exists in the fixing of base facility requirements. There is no doubt but that improvement in this regard will result in a substantial increase in construction efficiency for bases to be built both in this country and abroad.

8. Through the action of this and other committees the insistence of Congress upon austerity in military construction has been impressed on the services. The committee has not been satisfied with steps that have been taken to assure compliance with economy directives by uniformed officers of the armed services. Only a few isolated instances of disciplinary action occasioned by disregard for careful use of public funds have been reported to the committee in response to its request for such information. The committee requests, therefore, that each of the services furnish a complete report on such disciplinary measures taken since July 1, 1950, prior to the presentation of the fiscal year 1954 budget request for military public works.

9. The establishment of unrealistic completion periods for construction jobs have caused great confusion and waste in the past. For new construction this has caused excessive use of the negotiated and cost-plus-fixed-fee contract. It is impossible to set down a definite time schedule for military construction and eliminate all need for speed. This must of course be governed by the all-important needs of national defense in any given circumstance. However, it must always be kept in mind that great projects cannot be built in haste without a considerable increase in cost and great chance for confusion, inefficiency, and waste. In assigning completion dates these two factors must be carefully balanced against each other. Lack of careful judgment in this regard has proven most costly. The committee has been shown cases where less haste at the planning, design, and contracting stages would have produced not only a better but a quicker job. In view of the dangers involved at least the existing legal and administrative restrictions on the use of CPFF and negotiated-type contract should be maintained. The committee has one further suggestion in this regard. A comparison of a great number of rehabilitation projects indicates that if properly controlled the CPFF lends itself naturally to this type of work, and it is recommended that the matter be studied to see whether under proper restrictions a more efficient rehabilitation job might be expected from use of CPFF procedure, rather than other contract types.

10. The committee has noted that the experienced personnel of the Corps of Engineers is spread thin over the great volume of critical military construction. It recommends that more experienced officers be assigned to this sensitive work area. The high ratio of high ranking and more experienced officers in the corps civil-functions work has been noted.

11. Throughout the services there has existed a feeling of compulsion to spend all available money of either the year-end or no-year variety before the end of the fiscal year regardless of the interests of economy.

This has resulted in a rush during the month of June to obligate funds and has created a most inefficient peaking of funds in that one month. This attitude must be corrected at once and steps must be taken to develop specific safeguards against the evil. One remedy surely exists in a greater refinement of the construction program to the point that the monthly rate of obligation could be plotted and staggered in more orderly detail.

12. The armed services officials have sometimes been less than candid and have failed to make complete disclosure of over-all construction needs and programs to the committee. The foot-in-the-door technique has been used to get initial appropriations which later had to be supplemented in order to obtain full utilization of facilities. The committee feels that it is entitled to complete candor and to know the full projected program with respect to over-all construction plans at the time of initial requests for partial funding.

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